

## CLAIMS

1. An apparatus for removing semiconductor chip (5) in which one out of a plurality of semiconductor chips (1) formed from a diced semiconductor wafer (2) is removed from a pressure-sensitive adhesive sheet (3) which holds the semiconductor chips by adhering thereto, so that the semiconductor chip is possible to be extracted from the adhesive sheet, comprising:

a removing member (21) having a plurality of protruding portions (30) for coming into contact with a bottom surface of the semiconductor chip through the adhesive sheet and a plurality of suction hole portions (32) formed in recess portions (31) in between the respective protruding portions for sucking the adhesive sheet so as to partially remove the adhesive sheet from the semiconductor chip at suction positions;

a holding portion (22) for sucking and holding the adhesive sheet around the removing member; and

a removing member moving device (24) for moving the removing member along the bottom surface of the semiconductor chip so as to vary contact positions of the adhesive sheet with the respective protruding portions and the suction positions of the adhesive sheet through the respective suction hole portions, wherein

in a state that a bottom surface of the adhesive sheet is sucked and held by the holding portion and the adhesive sheet is sucked through the respective suction hole portions so as to be partially removed, the respective contact positions are moved to the suction positions by moving the removing member by the removing member moving device, so that a region of the partial removal between the bottom surface of the semiconductor chip and the adhesive sheet is made to expand.

2. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the removing member is formed so that an adhesion region (R1) of the semiconductor chip to be removed to the adhesive sheet is disposed in a region of a top surface of the adhesive sheet corresponding to a movement region (R2) of the respective protruding portions of the removing member by the removing member moving device.

3. The apparatus for removing semiconductor chip as defined in Claim 2, wherein the holding portion is formed so that a region of a top surface of the adhesive sheet corresponding to a suction region (R3) by the holding portion is disposed adjacent or close to the adhesion region of the semiconductor chip to be removed.

4. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the respective suction hole portions are formed on bottom sections of the respective

recess portions, and

the bottom surfaces of the adhesive sheet disposed in between respective contact positions by the respective protruding portions adjacent to each other are sucked through the respective suction hole portions so as to be brought into contact with or be close to top surfaces of the respective recess portions for the removal.

5. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the semiconductor chip is almost entirely removed from the adhesive sheet by changing an almost entire bonding of the semiconductor chip to the adhesive sheet by adhesion to a partial bonding by suction through the respective suction hole portions, and further moving the removing member by the removing member moving device so as to change positions of the partial bonding and decrease bonding force by the adhesion.

6. The apparatus for removing semiconductor chips as defined in Claim 1, wherein force of the holding portion to suck and hold the pressure-sensitive adhesive sheet is set to be larger than force of the respective suction hole portions to suck the pressure-sensitive adhesive sheet.

7. The apparatus for removing semiconductor chip as defined in Claim 1, wherein a movement range of the respective protruding portions in the removing member is set to be larger than at least a formation interval of the

respective protruding portions.

8. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the movement of the removing member by the removing member moving device is a reciprocal  
5 movement of the removing member along the bottom surface of the semiconductor chip.

9. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the movement of the removing member by the removing member moving device is a rotating  
10 movement of the removing member around a direction almost perpendicular to the bottom surface of the semiconductor chip.

10. The apparatus for removing semiconductor chip as defined in Claim 8, wherein the removing member moving  
15 device is operable to move the removing member reciprocationally so as to vibrate the removing member.

11. An apparatus for feeding semiconductor chips, comprising:

the apparatus for removing semiconductor chip (5)  
20 as defined in Claim 1;

a wafer holding unit (4) for holding the semiconductor wafer in the state of adhering to the adhesive sheet; and

a removing apparatus moving device (6) for  
25 relatively moving the apparatus for removing semiconductor

chip along a surface of the semiconductor wafer which is held by the wafer holding unit and aligning one out of the respective semiconductor chips and the removing member; wherein

5           the semiconductor chips are removed from the adhesive sheet so that the semiconductor chips are fed.

12.       A method for removing semiconductor chip in which one out of a plurality of semiconductor chips (1) formed from a diced semiconductor wafer (2) is removed from a  
10       pressure-sensitive adhesive sheet (3) which holds the semiconductor chips by adhering thereto, so that the semiconductor chip is possible to be extracted from the adhesive sheet, comprising:

          bringing a plurality of protruding portions (30)  
15       of a removing member (21) into contact with a bottom surface of the semiconductor chip through the adhesive sheet at a region (R2) on a bottom surface side of the adhesive sheet while sucking and holding a vicinity of the bottom surface-side region (R2) of the adhesive sheet  
20       corresponding to an adhesion region (R1) of the semiconductor chip;

          sucking the adhesive sheet in between the respective protruding portions so as to partially remove the adhesive sheet in the adhesion region from the  
25       semiconductor chip at suction positions;

moving respective contact positions with the protruding portions to the suction positions on the bottom surface-side region of the adhesive sheet by moving the removing member along the bottom surface of the semiconductor chip, so that a region of the partial removal in the adhesion region is made to expand.

13. A method for removing semiconductor chip as defined in Claim 12, wherein force to suck and hold the vicinity of the bottom surface-region of the adhesive sheet corresponding to the adhesion region is set to be larger than force to suck the adhesive sheet in between the respective protruding portions.

14. A method for removing semiconductor chip as defined in Claim 12, wherein the movement of the removing member is a reciprocal movement of the removing member along the bottom surface of the semiconductor chip.

15. A method for removing semiconductor chip as defined in Claim 14, wherein an amplitude in the reciprocal movement of the removing member is larger than a formation interval of the respective protruding portions.

16. A method for removing semiconductor chip as defined in Claim 12, wherein the movement of the removing member is a rotating movement of the removing member around a direction almost perpendicular to the bottom surface of the semiconductor chip.